

CONTEXT OF THIS COURSE IN THE PROGRAM

This course is given during the second session of the program.

By the end of the course, students will have developed their abilities to:

- Select lubricants and fuels.
- Check the quality of lubricants and fuels.
- Carry out lubricant and fuel contamination tests and analyses.
- Select a solvent to clean a part.
- Choose and carry out preparations for different types of plastics.
- Record information in the appropriate documents.

This course is a co-requisite with Course 280-245-EM.

Students must keep this course outline for the duration of their studies as it will be useful for the comprehensive assessment at the end of the program.

Transport Canada: This course outline meets the requirements of Training Organisation Certification Manual (MCF) of Transport Canada. The Department applies Transport Canada standard which allows a maximum absence of 5% for the course (theory and laboratory). The department compiles absences of all students enrolled in Aircraft Maintenance (280.C0) and Avionics (280.D0) according to Transport Canada requirements. The application of Transport Canada policies regarding absences is available on the college website and in the student agenda under the heading « Privilèges accordés par Transports Canada ».

COMPETENCE OF GRADUATE PORTRAIT

Master the aeronautical maintenance techniques.

MINISTERIAL OBJECTIVE(S) (CODE AND STATEMENT)

025R Master work techniques in aeronautical maintenance.

TERMINAL COURSE OBJECTIVE

Use organic and synthetic materials.

EDUCATIONAL ORIENTATION

Theory:

While essentially delivered with a formal lecture format, a variety of pedagogical methods are used including presentations using a multi-media projector or the blackboard, use of organic parts and products as well as films.

Practical Work:

Using a variety of teaching methods, the practical work involves handling organic materials with laboratory equipment as well as laboratory technologies delivered as a lecture. Students will handle materials in teams.

COURSE PLAN – THEORY

Activity Period: Weeks 1 to 5

Learning Objectives: 1.1 to 1.4 and 3.1 to 3.2

- 1.1 Describe cleaning products and common solvents.
- 1.2 Describe the physical and chemical characteristics of solvents and cleaning products.
- 1.3 Establish links between the solvents used and the effects on different materials of the parts.
- 1.4 Use applicable standards and specifications for cleaning.
- 3.1 Explain the influence of the refining processes on the final petroleum products.
- 3.2 Name the different hydrocarbons present in lubricants and fuels according to the rules of systematic nomenclature.

Content

- Classify solvents and cleaning products.
- Determine the reactivity, solvency and oxidation.
- Describe materials used in aeronautics.
- Determine the compatibility and incompatibility between products and parts.
- Describe WHMIS for properly handling and storing solvents.
- Understand processes for refining and their environmental effects
- Understand saturated, unsaturated, sulfured and aromatic compounds

Activity Period: Weeks 6 to 10

Learning Objectives: 3.3 and 3.4

- 3.3 Compare different fuels: automotive and aviation gas, jet fuel.
- 3.4 Select the proper fuel as a function of the conditions of operation, standards, specifications and recommendations.

Content

- Physical and chemical characteristics of fuels: octane and performance numbers, volatility, energy of combustion, coloring, etc.
- Consequences of using automotive fuels in aviation and aviation fuels in automobiles.

Activity Period: Weeks 11 to 15

Learning Objectives: 2.1 to 2.5 and 3.5 to 3.6

- 2.1 Describe and explain the nature of plastics and composites.
- 2.2 Compare the physical and chemical characteristics and properties of plastics and composites.
- 2.3 Describe the range of uses of plastics and composites.
- 2.4 Use resins and catalysts properly according to standards and specifications.
- 2.5 Handle and store resins and catalysts properly.
- 3.5 Compare various lubricants.
- 3.6 Make a judicious selection of various lubricants according to operating conditions, standards, specifications and recommendations.

Content

- Classifying plastics based on their nomenclature.
- Composition and structure of polymers: thermoplastics, thermosettings and elastomers.
- Different types of fiber composites: fiberglass, carbon fiber, etc.
- Understanding aeronautical applications of diverse plastics and composites.
- Defining processes of polymerization and of different catalysts
- Regulations related to handling and storing materials (WHMIS).
- Describing functions of lubricating oil and greases.
- Describing different physical and chemical characteristics.
- Identifying different additives.
- Comparison of mineral and synthetic oils.
- Comparison of different greases.
- Classifying the performance of lubricating oils.

COURSE PLAN – LAB

The laboratory part of the course consists of experiments in rotation allowing students to achieve the different learning objectives. The timeline of the experiments will be distributed during the first course of the session.

Activity Period: Weeks 1 to 15

Learning Objectives: 4.1 to 7.2

- 4.1 Use the different measuring instruments appropriately.
- 4.2 Properly interpret different tests.
- 4.3 Handle and store fuels and lubricants appropriately.
- 5.1 Handle and store fuels and lubricants appropriately.
- 5.2 Use different measuring instruments appropriately.
- 5.3 Analyze results from different tests made on fuels and lubricants.
- 6.1 Describe the entries to be made in different documents when analyzing organic and synthetic materials.
- 6.2 Make entries in documents.
- 7.1 Apply health and security regulations related to the workplace.
- 7.2 Apply environmental regulations related to the workplace.

Content

- Using experimentation standards
- Describing laboratory equipment.
- Determining properties and characteristics of different fuels and lubricants.
- Making links between the characteristics of fuels and lubricants and engine operation.
- Identifying different physical and chemical tests.
- Using technical diagrams and data sheets
- Using methods that respect health and safety (WHMIS)
- Identifying different types of contaminants of lubricants.
- Establishing links between the contamination of lubricants and engine operation.
- Describing special documents (measurement registration sheets, etc.)
- Describing and using required protective equipment

Terms of Summative Evaluation
THEORY

Description of the evaluation activity	Context	Learning Objective(s)	Evaluation criteria	Due Date (date assignment is due or exam date)	Weighting (%)
Written Exam	Individual for up to 3 hours	1.1 to 1.4 3.1 to 3.4	Veracity and validity of statements. Quality of content and completeness. Adequate use of terminology. Understanding the operation and precision of explanation. Appropriate procedure and units for calculations.	Week 7	25%
Written Exam	Individual for up to 3 hours	1.1 to 3.6	Veracity and validity of statements. Quality of content and completeness. Adequate use of terminology. Understanding the operation and precision of explanation. Appropriate procedure and units for calculations.	Week 15	35%

Sub-total: 60%

PRACTICAL WORK

Description of the evaluation activity	Context	Learning Objective(s)	Evaluation criteria	Due Date (date assignment is due or exam date)	Weighting (%)
Written Exam	Individual for up to 2 hours	4.1 to 7.2 (Weeks 1 to 4)	Veracity and validity of statements. Quality of content and completeness. Adequate use of terminology. Understanding the operation and precision of explanation. Appropriate procedure and units for calculations.	Week 5	15%
Written Exam	Individual for up to 2 hours	4.1 à 7.2	Veracity and validity of statements. Quality of content and completeness. Adequate use of terminology. Understanding the operation and precision of explanation. Appropriate procedure and units for calculations.	Week 15	25%

Sub-total: 40%
TOTAL: 100%

REQUIRED MATERIAL

- Theory: Manuel « Carburants, lubrifiants et plastiques utilisés en aéronautique » and SHARP EL 531 calculator.
- Laboratory: Course notes, SHARP EL 531 calculator, lab coat (ENA), safety glasses and safety shoes.

MEDIAGRAPHY

- ARNAUD, P. Cours de chimie organique, Gauthier-Villars, Paris, 1978, 472 p.
- ASM International Handbook Committee, Engineered Materials Handbook, vol.1 (composite), vol.2 (engineering plastics), ASM International, 1988.
- ASTM, Annual Book of ASTM Standards, Vol 5, 1992.
- DURIER, Y., Caractéristiques des carburants et combustibles et leur influence sur le fonctionnement des moteurs. Éd. Technip, Paris, 1971, 308 p.
- GROFF, J.L.E., ABC du graissage, Editions Technip, Paris, 1961.
- GRUSE, William A., Chemical Technology of Petroleum, McGraw-Hill, 1960.
- GUIBET, J-Claude, Carburants et moteurs, tomes 1 & 2, éditions Technip, 1987.
- GUTHRIE, V.B., Petroleum Products Handbook, McGraw-Hill, Montréal.
- HARPER, Charles A., Handbook of Plastics and Elastomers, McGraw-Hill Book Co., 1975.
- JOLICOEUR, R., Carburants, lubrifiants et plastiques, Griffon d'argile, 1992.
- KLAMANN, D., Lubricants and Related Products, Verlag Chemie, 1984.
- LICHTY, L.C., Combustion Engine Processes, 7e éd., McGraw-Hill, Toronto, 1967.
- O'CONNOR, J., BOYD, J., Standard Handbook of Lubrication, McGraw-Hill, 1968.
- SCHILLING, A., Les huiles pour moteurs et le graissage des moteurs, Tome 1, 2e éd., Éd. Technip, Paris, 1975.
- STEELE, G.L., Exploring the World of Plastics, McKnight Publishing Co, 1977.
- TREAGER, I., Aircraft Gas Turbine Engine Technology, 2e éd., McGraw-Hill, Montréal, 1979, 586 p.
- WEISSMANN, J., Carburants et combustibles pour moteurs à combustion interne, Éd. Technip, Paris, 1970, 720 p.

REQUIREMENTS TO PASS THE COURSE

(1) Passing Mark

The passing mark for this course is 60%, which is calculated by adding the marks for the theoretical and the practical parts of the course. (PIEA article 5.1m)

(2) Attendance for Summative Evaluations

Attendance is mandatory for summative evaluation activities. Students must comply with the requirements to carry out the evaluation activity as provided by the teacher and written in the course outline.

Students who arrive late to a summative evaluation activity without justification may be refused the right to participate in the activity.

Students who are absent without a serious justification (illness, death in the family, serious incident, etc.) from a summative evaluation may receive a mark of zero (0) for the activity.

It is the student's responsibility to meet with the teacher before an evaluation activity or immediately upon his or her return to ÉNA to explain the reasons for the absence and provide supporting documentation. If the reasons are serious and recognized as such by the teacher, the conditions for a postponed evaluation activity will be arranged between the teacher and the student.

(3) Submitting Assignments

Assignments must be submitted by the date, place and time determined by the instructor. Any assignment submitted after the due date will be penalized 10% per day for each day it is late up to a week. After one week, the assignment will be graded a zero (0).

(4) Presentation of Written Work

The teacher will provide students with information and guidelines for methodical and orderly presentation of work. When the presentation of work that has been submitted is judged to be unacceptable, correction of this work will be delayed until the work meets the standards set by the teacher. In this case, penalties for delays in submitting work will apply.

Students must follow the standards adopted by the Cégep for written work (*Normes de présentation matérielle des travaux écrits*). These can be found in the documentation centre on the Cégep Web Site <http://ena.cegepmontpetit.ca/liens-eclair> under the heading **Liens éclair**, **Bibliothèques**, « **Aide** ».

(5) Quality of English

A teacher may refuse or delay acceptance of any submitted work if the level of English is considered unacceptable. If the work is refused, it will receive a mark of "0." If the teacher delays acceptance, the work is subject to the same penalties listed under "Submitting Assignments."

RULES FOR CLASS PARTICIPATION

Lab coats, safety shoes and safety glasses must be worn in the laboratory from the second class in the lab. Access to the laboratory will be prohibited to any student who is not wearing a lab coat, safety shoes and safety glasses.

It is forbidden to eat or drink (contamination) in the laboratory.

After handling, the material used must be cleaned, washed and put in its place; papers must be thrown away in the trash basket, and the workspace must be cleaned before leaving.

OTHER DEPARTMENTAL REGULATIONS

Students are encouraged to consult the website for specific regulations related to this course:

<http://guideena-en.cegepmontpetit.ca/departement-rules/>

INSTITUTIONAL POLICIES AND REGULATIONS

All students enrolled to the National Institute of Aeronautics, at Cégep Édouard-Montpetit must become familiar with and comply with the institutional policies and regulations. In particular, these policies address learning evaluations, maintaining admission status, French language policies, maintaining a violence-free and harassment-free environment, and procedures regarding student complaints. The French titles for the policies are: *Politique institutionnelle d'évaluation des apprentissages* (PIEA), la *Politique institutionnelle de la langue française* (PILF), la *Politique pour un milieu d'études et de travail exempt de harcèlement et de violence* (PPMÉTEHV), les *Conditions d'admission et cheminement scolaire*, la *Procédure concernant le traitement des plaintes étudiantes dans le cadre des relations pédagogiques*.

The full text of these policies and regulations is accessible on the Cégep web site at the following address: <http://www.cegepmontpetit.ca/ena/a-propos-de-l-ecole/reglements-et-politiques>. If there is a disparity between shortened versions of the text and the full text, the full text will be applied and will be considered the official version for legal purposes.